DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application]This invention relates to textiles, such as a nonwoven fabric whose biodegradation rate using the low amount of preferred orientation and low degree-of-crystallinity textiles excellent in biodegradability, and these textiles improved.

[0002]

[Description of the Prior Art]In order for plastics to improve and conquer various faults which a natural material has originally, mainly at the time of the use, the characteristic at the time of manufacture is improved, and they live people's life a rich thing and are becoming indispensable to everyday life now. However, these plastics cannot but return automatically like a natural product, and it must be said that it has been made neglectful about the adverse effect which the processing after the use, especially it have to the earth until now. and although the product is indispensable to everyday life therefore, carry out the huge increase in the disposable product, and the increase in a still newer material product to the incineration -- it is a burial imitation -- it is coming till the place which has the serious influence for earth environment. It is under such a situation and the polymer material which is disassembled by bacteria and the microorganism and returns automatically in natural environment, i.e., a biodegradable plastic, has come to attract attention from urgency in recent years. Especially this invention relates to the invention which uses this biodegradable plastic more effectively.

[0003]As a means to obtain a biodegradable plastic, roughly divide now and Three methods, Namely, the method (made by British ICI), for example, product name Biopole, of using (1) microorganism function, (2) The method by a chemosynthesis method, for example, a product name plaque cell (made by a die cell chemicals company), The Bionolle (made by Showa High Polymer Co., Ltd.) has the method of using (3) naturally-ocurring polymers, for example, product name Mater-Bi etc., (made by ** nova MONTO), and it is also known that it can be

considered not only as the ability of these plastics to carry out a fabricating operation to a film and a sheet but as textiles.

[0004]

[Problem(s) to be Solved by the Invention]From textiles to the nonwoven fabric in which this invention person consists of this kind of biodegradable plastic. After building textiles, such as textile fabrics and knitted fabric, using this textile as the product of a disposable use, for example and using this product, it is inside of the ground, or [/and underwater (below)]. this -- only -- the inside of the ground -- outlining -- it decomposes as promptly as possible and enables it to compost further by bacteria or a microorganism (composting) -- being alike -- it has been examined how this textile is constituted. If it becomes what, according to this invention persons' examination, the catabolic rate in the inside of the ground of a biodegradable textile will be because the insufficient thing was accepted by the case. Therefore, this invention is to speed up more the catabolic rate in the inside of the ground of a biodegradable textile, without how constituting this textile and as what kind of textiles considering it for that purpose, and uses this SUBJECT as a solution plug.

[0005]

[Means for Solving the Problem]Above-mentioned SUBJECT is attained by constituting as follows. "Namely, this invention, a number average molecular weight consists of aliphatic polyester which is 5,000 or more, biodegradable fiber, wherein the amounts of preferred orientation (deltan) are $3x10^{-3}$ - $80x10^{-3}$ and degrees of crystallinity are 5% - 50%. " -- it proposing and, It proposes constituting in "a biodegradable textile constituted using a biodegradable fiber indicated to Claim 1, and other biodegradable subject textiles." And it proposes again constituting in "a biodegradable nonwoven fabric which mixes this with other biodegradable subject textiles, and combines between these subject textiles using as a binder a biodegradable fiber indicated to Claim 1" as a more desirable mode of this textile.

[0006]a textiles binder used with a common nonwoven fabric in a binder which combines between the textiles with constituting a nonwoven fabric for example, it consists of biodegradable textiles -- for example, If a polyester fiber binder was used, there is no biodegradability in itself, and with this binder, a resin binder, for example, a polyvinyl alcohol system binder, once needs to make a nonwoven fabric a damp or wet condition, it needs to carry out dry heat adhesion, and there is inconvenience that weld processing cannot be carried out in dryness. For example, although applying heat and pressure to Webb who consists of these textiles, carrying out thermal melting arrival of between the textiles, and considering it as a nonwoven fabric is also considered using the melting point of textiles which consist of the aforementioned biodegradable plastic being comparatively low, without using other binders, It is required that a nonwoven fabric of catabolic rate in inside of the ground which becomes only for textiles which consist of such a biodegradable plastic should also be insufficient, and the

speed should be raised with it by a case as mentioned above. And not only when that object is a nonwoven fabric, but in the case of textile fabrics, knitted fabric, this demand is the same. The demand is not restricted to a kind of textiles of biodegradability which constitutes the target textiles further again.

[0007]Although biodegradable textiles are used as subject textiles, a demand of the above [this invention], As well as this, without making a biodegradable plastic fiber into a drawn fiber, the low amount of preferred orientation and textiles of a low degree of crystallinity, i.e., what is called a non-drawn fiber, (for simplification, it may only be indicated as a non-drawn fiber below) are used, and this is mixed and used for subject textiles. And a textile which it comes by this to comprise a biodegradable non-drawn fiber as well as subject textiles which consist of biodegradable fibers, When it enters into the ground, a non-drawn fiber is decomposed extremely early first in the first step, this textile becomes scattering and decomposition of subject textiles is early advanced by it in the following step [2nd]. Namely, in this invention, a point of using the low amount of preferred orientation and a biodegradable sheep drawn fiber of a low degree of crystallinity is important, and to the whole textile by decomposition of an early stage of this non-drawn fiber for propagation of bacteria and a microorganism so to speak, a culture medium and an opening place which were expanded more can be built, by this, it is sped up greatly, and after all, compared with a case of a textile which consists only of textiles with high (extension) the amount of preferred orientation and a degree of crystallinity, catabolic rate as the whole textile is boiled markedly, and decomposition of subject textiles can also raise it.

[0008]Thus, this invention proposes a non-drawn fiber as a component of this textile for gathering catabolic rate of a textile which consists of biodegradable fibers, and an unextended binder fiber. The amount of preferred orientation (deltan) with a grade of not extending of the textiles And $3x10^{-3}$ - $80x10^{-3}$, Low orientation whose degrees of crystallinity are 5% - 50%, a thing of a low degree of crystallinity, and a thing whose amounts of preferred orientation (deltan) are $6x10^{-3}$ - $30x10^{-3}$ and whose degrees of crystallinity are 10% - 40% preferably are said. If the amount of preferred orientation and a degree of crystallinity are lower than the above-mentioned minimum, when handling as textiles becomes higher than a maximum difficultly, it becomes impossible to attain the purpose of this invention which points to rapid decomposition by bacteria or a microorganism. As mentioned above, the amount of preferred orientation and a degree of crystallinity of these textiles specify a range which these textiles hold moderate mechanical properties as textiles, and becomes more nearly amorphous and has efficiency, and double reflex deltan as that index shows the amount of preferred orientation of textiles. This double reflex deltan is called for from densimetry using a density gradient tube as it asks from each refractive index (the direction of a fiber axis, rectangular directions) of each sample textiles by an interference microscope and a degree of crystallinity

is generally also performed.
[0009]A manufacturing method of the above low amounts of preferred orientation and textiles of a low degree of crystallinity carries out melt spinning of the aliphatic polyester with a conventional method, for example, and it is obtained by taking over without performing extension of a grade adopted ordinarily. These textiles are usually used, cutting into a staple fiber. Use is presented with these textiles in a form which gave crimp according to the purpose.

[0010]As a polymer raw material for considering it as the above low amounts of preferred orientation and a non-drawn fiber of a low degree of crystallinity, and considering it as biodegradable textiles, 5,000 or more aliphatic polyester has a preferred number average molecular weight. Polymer by which they are obtained from diol which is 2-6 as such polymer by aliphatic dicarboxylic acid whose carbon numbers are 4-10, and a carbon number making diisocyanate react to polyester produced by carrying out a polycondensation and these polyester is used preferably. In order to consider it as textiles which have the suitable intensity, the number average molecular weight is required for 5,000 or more things, but as for this aliphatic polyester, 10,000 or more and further 40,000 or more are more preferably more preferred.
[0011]That melting point is about 50-130 **, and as for the above-mentioned aliphatic polyester, in order to make it paste up by heat and a pressure using a non-drawn fiber which consists of this aliphatic polyester, it is preferred to use a temperature higher not less than at least 5 ** than these melting points.
[0012]Although a drawn fiber which consists of the above-mentioned aliphatic polyester is preferred as subject textiles of a textile, it is not restricted to these textiles, and if it is textiles which have the biodegradability by a microorganism, it is applicable to this invention. polyester which the above-mentioned microorganism builds as such subject textiles -- for example, polymer from a copolymer and polysaccharide of polyhydroxybutyrate and BARIRETO, and polymer obtained by chemosynthesis -- for example, Polycaprolactone, aliphatic series system polyester, a Polly gamma-methyl glutamate, Polylactic acid, poly glycolide, or a mixture of chitosan and cellulose which made a natural product a subject, Cotton, rayon, Bemberg rayon, silk, wool yarn, hemp, etc. which are conventionally used as fibrin material can be used besides a mixture of starch and polyvinyl alcohol, a starch subject's polymer, etc.
[0013]A textile which consists of these subject textiles and a non-drawn fiber interweaves both textiles, is mixed, and change it not only into it but the state where both mixed as a result, and let them be textile fabrics, knitted fabric, and a nonwoven fabric with a conventional method. In the case of a nonwoven fabric, are built by all of wet process that are known for paper milling of a dry method from card WEBBU or paper which uses the above-mentioned sheep drawn fiber as a binder which combines subject textiles, and is generally used conventionally, but.

Anyway, subject textiles and a binder fiber can be combined and built under a predetermined pressure with a hot wind, warm temperature water, steam, etc. As for a non-drawn fiber, even if it uses any of the above, it is common to blend about 20 to 80% to subject textiles, but it is made a lot of blended ratios as for which surface layers, such as a case of a multilayer nonwoven fabric, contain even 100% depending on a use, and the tapetum can also use a low blended ratio.

[0014]Drawing 1 is the expanded partial mimetic diagram in the case of a biodegradation student nonwoven fabric as an example which used biodegradable unextended Bayda' textiles of this invention, 1 shows the subject textiles and 2 shows this non-drawn fiber (binder fiber). Drawing 2 is a mimetic diagram of a decomposition process in inside of the ground of a nonwoven fabric in this invention, and is a stage of (1), The binder fiber 2 shown with a dashed line becomes scatteringly in response to the early decomposition it is amorphous, therefore according to bacteria and a microorganism more nearly first than subject textiles of a crystalline substance, and in a stage of (2). It is a key map for explaining that early decomposition of the subject textiles 1 progresses after a culture medium for propagation of bacteria and a microorganism and an opening place have increased.

[0015]

[Example]Working example explains this invention still more concretely below.

<<Manufacture of textiles>> Use succinic acid as an acid component and butanediol 1.4 is used as a glycol component, Performed esterification and a polycondensation with the conventional method, compounded polyester, hexamethylene diisocyanate was made to react to this further, and the with the number average molecular weight 48,700 and a melting point of about 120 ** aliphatic polyester by which Polymer Division quantification was carried out was obtained. supplying a screw die pressing appearance machine using this polyester -- nozzle hole 0.5 mm in diameter, and a hole -- melt spinning was performed by a part for 50 number, spinning temperature [of 180 **], and coiling speed/of 600 m. Subsequently, this spinning line of thread was extended 5.0 times at the extension temperature of 50 **, and the fineness of 4.2 d, intensity 4.9 g/d, and polyester fiber (A) of 15% of ductility were obtained. The amount of preferred orientation of these textiles (A) was the degree of $120x10^{-3}$, and the degree of crystallinity was 55%. supplying the same screw die pressing appearance machine as the above using the same polyester as the above on the other hand -- nozzle hole 0.3 mm in diameter, and a hole -- a 30 number, spinning temperature of 180 **, and high-speed coiling speed spinning for /of 600 m were performed, and the fineness of 3.0 d, intensity 1.5 g/d, and unextended polyester fiber (B) of 40% of ductility were obtained. The amount of preferred orientation of these textiles (B) was the degree of $10x10^{-3}$, and the degree of crystallinity was 15%.

[0016]<<An experiment of the catabolic rate in a fibrous form>>

Working example 1, comparative example 1: The above-mentioned polyester fiber (A) and (B) was respectively buried in summer three-month soil insulation (from the surface to the bottom of 10 cm), it took out after that, and the powerful retention of each filament was measured. As opposed to the powerful retention of the above-mentioned polyester fiber (A) which is extended and in which the amount of preferred orientation and degree of crystallinity are both comparatively high being 50% (comparative example 1), The Takanobu growth is not received, but decomposition progresses, measurement is improper (working example 1) and the powerful retention of the above-mentioned polyester fiber (B) with the low amount of preferred orientation and degree of crystallinity is understood that latter textiles have the greatly early catabolic rate by the bacteria in the inside of the ground, and a microorganism.

[0017]<<Manufacture of a nonwoven fabric>> 40% of polyester fiber (B) is mixed to 60% of the above-mentioned polyester fiber (A), The random webber was supplied, Webb was created, heat pressing was performed with the conventional method, and the nonwoven fabric (X1) whose length x width is 10 cm x 10 cm was obtained by eyes 40 g/cm^3 which polyester fiber (B) fused between polyester fiber (A), and was pasted up. Polyester fiber (A) is used, not using the above-mentioned polyester fiber (B) as a comparative example, Webb of conditions was created like the above, needle punching was performed lightly, and the nonwoven fabric (X2) whose length x width is 10 cm x 10 cm was obtained by eyes 40 g/cm^3 like the above which consists of 100% of polyester fiber (A).

[0018]<<The experiment 1 of the catabolic rate in a nonwoven fabric gestalt>>
Working example 2, comparative example 2: Two each of the above-mentioned nonwoven fabric sample (X1, X2) was used, respectively, and was made into a two-sheet pile, this was buried in the three-month soil insulation (from the surface to the bottom of 10 cm) of a summer, the predetermined date after surface coating ground was removed, and the decomposition state of this sample was observed in detail. Although both the above-mentioned sample X1 (working example 2) and the sample X2 (comparative example 2) have received decomposition by a microorganism, the decomposition in the direction of the sample X1 is following them more to the sample X2. It in the direction of the sample X1 is the point with other portions that it is not behind and decomposition is progressing good, to decomposition in the portion to which a more remarkable difference is respectively located in the heavy side (longitudinal plane of symmetry) of a two-sheet pile being behind in it of the sample X2.

[0019]<<The experiment 2 of the catabolic rate in a nonwoven fabric gestalt>>
working example 3 and comparative example 3: Using said nonwoven fabrics X1 and X2, similarly it buried in the ground under 10 cm during two months of a summer, took out out of the date of after this ground, and was considered as the three each chip box (namely, -- considering it as a sample about 3 cm wide), and the tensile strength of each sample was measured. To it of the sample X1 being 1 kg/3cm width (working example 3), it of the sample

X2 is 0.3 kg/3cm width (comparative example 3), and it turns out that decomposition of the sample X1 progresses early more.

[0020]

[Effect of the Invention]decomposition according to bacteria or a microorganism in some textiles where this invention constitutes a biodegradable nonwoven fabric as explained above -- ******** -- mixing the early low amount of preferred orientation and textiles of a low degree of crystallinity, making it join together, and making it use -- moreover -- for this reason, The biodegradable textile of this invention may be early decomposed more by finding out using these textiles as a binder fiber compared with the biodegradable textile which consists only of drawn fibers by this, and it is [therefore] advantageous also to the composting again. Although especially the case of this invention where it applies to how, i.e., the nonwoven fabric in which the low amount of preferred orientation and low degree-of-crystallinity textiles are influencing the structure of a textile, to use that the composition textiles which constitute a textile decompose at an early stage, and structure itself of a textile decomposes the structure into a state scatteringly is preferred on the effect, It is demonstrated even if there is, when the effect's applying to textile fabrics and knitted fabric, and the applied object is not restricted to a nonwoven fabric. Since the textile using the textiles of such this invention has the early resolvability like the above, As tea bag material and ** material, as a tray, food packing material, and the sheet for vehicles and a ceiling material, It is very suitable as disposable tableware and lunch box material as a drainer bag material and a bag material for kitchen garbages further again further again to use for uses, such as filter tip material, a sowing web material, and paper pot material, further again.

[Translation done.]